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turn out to be more fertile than other sheep and have a larger proportion of twins.

1. In regard to the first point mentioned no difficulty was experienced in developing the embryonic nipples into real functional mammaræ yielding milk; and for several years past the ewes born on Beinn Bhreagh (with extremely few exceptions) have possessed four functional nipples.

Of recent years lambs possessing five and six nipples have appeared, and it is obvious that continued selective breeding would ultimately result in the production of a six-nippled variety of sheep.

How far the number of functional mammaræ could be increased by selection it is of course impossible to predict; but it is worthy of note that one ewe has been born with four nipples on one side of the body and two on the other; and, as the supernumerary nipples have a tendency to appear in pairs, this probably foreshadows the possibility of an eight-nippled variety.

2. In regard to the second point mentioned the multi-nippled sheep have not proved to be more fertile than normally nippled sheep; and the proportion of twins born has been quite small.

One peculiarity, however, is worthy of notice: The twin lambs, though usually smaller at birth than single lambs, speedily come up to the average of the flock in this respect—so that by autumn there is no substantial difference in weight between the single and twin lambs. The multi-nippled sheep are, therefore, able to rear twins more successfully than normally nippled sheep.

This is an important point, and it suggests the advisability of attempting now—by the elimination of single lambs and the retention of twins for breeding purposes—to produce a twin-bearing stock.

At present the Beinn Bhreagh flock constitutes simply a scientific curiosity, and is of little practical value to the country. I propose to make it of value by engrafting upon it the twin-bearing tendency. In Nova Scotia the winters unfortunately are long, and the cost of winter feeding proportionally great, but the country is otherwise admirably adapted for

sheep-raising upon a large scale. The production of a twin-bearing stock would do much to promote this important industry by enabling the farmers to make a double profit upon lambs without additional cost.

The proposed experiments, however, can not be made with a small flock, and the natural increase of the Beinn Bhreagh flock is so slow that many years would elapse before it would be practicable to carry out the plans proposed. I have sought to increase the size of the flock by the purchase of multi-nippled sheep from surrounding farms, but an examination of several thousand sheep has convinced me that it is no longer possible to purchase sheep having the characteristics of the Beinn Bhreagh flock to a useful degree. I, therefore, propose to purchase large numbers of ordinary two-nippled ewes and mate them with Beinn Bhreagh rams—segregating the present flock as much as possible. The multi-nippled lambs born to the normally nippled ewes will enable us to increase the size of the multi-nippled flock beyond its natural increase—and be otherwise beneficial by the introduction of new blood; but the new blood will probably be detrimental to the particular line of selection hitherto pursued and lead to a reduction in the percentage of multi-nippled offspring in that flock.

The present, therefore, seems to be a fitting time to place in the hands of those interested in evolutionary problems, a detailed account of the flock; and I have prepared for private circulation two pamphlets, one entitled 'Multi-Nippled Sheep of Beinn Bhreagh, Living 1903, and Their Known Ancestors,' the other 'Sheep Catalogue of Beinn Bhreagh, Showing the Origin of the Multi-Nippled Sheep of Beinn Bhreagh and Giving all the Descendants Down to 1903.' I have great pleasure in presenting the first copies of these pamphlets to members of the academy specially interested in the subject.

ALEXANDER GRAHAM BELL.

#### BOTANICAL NOTES.

POPULAR HELPS IN THE STUDY OF THE FUNGI.

It is particularly gratifying to notice the efforts that Professor Kellerman, of the Ohio

State University, is making to help the teachers in the public schools of Ohio to a better understanding of the larger fungi. From time to time he issues a four-page folder under the name 'Mycological Bulletin,' consisting of a little text and a good deal of photographic representation of the species he is describing. We know of nothing like these leaflets elsewhere, and can not too heartily commend this method of popularizing the study of the fungi. When it is remembered that these bulletins cost the subscriber only about a cent apiece one wonders that the subscription list does not include every school teacher in Ohio, to say nothing of those outside of that fortunate state.

#### FOREST FIRES IN THE ADIRONDACKS IN 1903.

THE United States Bureau of Forestry has issued a circular (No. 26) on the forest fires in the Adirondacks, from which we learn that 'between April 20 and June 8, 1903, over 600,000 acres of timber land in northern New York were burned over' with an estimated loss of \$3,500,000. A very dry spring and 'culpable carelessness' were what brought about this great loss. 'Deliberate incendiarism' is charged with no small number of fires, while a few are due to unavoidable accident. The author of the circular says after careful examination that 'fully one half of the fires are due to carelessness caught from locomotives' of the railroads in the forests. It is known that a particular excursion train hauled by two locomotives set almost continuous fires for a distance of ten miles. The burning of brush and other débris, the carelessness of smokers, the failure to extinguish smudges and camp fires contributed to the grand total of carelessness. Many fires were set deliberately, in part by those who resent the formation of private preserves, partly by those who do not like the present timber regulations, partly by those who profit by the labor afforded by fire fighting, some by hunters, some by those who hope thereby to increase the berry crop, or the crop of ginseng, etc. A large map tells the story of destruction and loss better than it can be told by words. The circular should serve to awaken the public conscience,

and should result in more effective legislation, and a better enforcement of existing laws.

#### THE BACTERIOLOGICAL ANALYSIS OF SOILS.

A RECENT bulletin of the Delaware Experiment Station brings out an interesting relation of bacteria to the fertility of the soil. It has long been known that certain bacteria in the soil add to its available nitrogen for plant growth, and now Professor Chester has actually made bacteriological analyses of the soil for the purpose of determining the nitrifying efficiency of its bacteria. In soils containing respectively 4,000,000, 3,130,000 and 250,000 bacteria per gram of dry soil the nitrifying efficiencies were 26.68, 13.75 and 2.13. Professor Chester concludes 'that while zymotic efficiency is generally proportionate to the total number of bacteria present in soil, it is not exactly proportionate.' 'It is not only numbers of bacteria but also kinds which determine the efficiency of a soil.' Further on he says 'there is a possibility that the future will develop some practical means of introducing favorable bacterial forms into the soil, and thus of raising its bacterial potential.' Here is a field for the scientific agriculturist not thought of by our fathers, who, if they knew anything at all about bacteria, regarded them as vermin to be avoided as far as possible, and even now most of us think of 'germs' and 'microbes' as dangerous things to have about. Evidently we have done the tribe of the bacteria an injustice, for it looks as though our crops were dependent upon their presence in sufficient quantity in our fields. Is it possible that the farmer of the future may regularly inoculate his fields before planting to a particular crop? While all this is quite funny, Professor Chester has done a piece of good work, and it is to be hoped that he may have the time and inclination to continue it.

#### THE STUDY OF OUR MOSSES.

ANY one who has attempted to take up the study of the mosses of his neighborhood must have been impressed with the feeling that there is a crying need of a work on the systematic botany of these pretty plants which

is usable by amateurs and other non-technical bryologists. The general botanist who wishes to know something about all kinds of plants has often felt that there is a needless technicality in the books devoted to the lower plants, and with the single exception of the lichens, the mosses have suffered most of all. Several years ago Professor Grout began work on the descriptive botany of the mosses with the intention of remedying this condition of things, and the result was a handy little elementary manual entitled 'Mosses with a Hand-Lens.' The success of this booklet has encouraged him to undertake a larger book, to which he gives the name 'Mosses with Hand-Lens and Microscope.' Of this, Part I. was published some time last year and was noticed in *SCIENCE* upon its appearance. Part II. is now in the press, and is to appear about the middle of May. An examination of advanced sheets shows that this is to be still better than the first part. With this book, when completed, the study of the mosses will be little more difficult than that of the flowering plants.

#### SUMMER BOTANY.

THE seaside laboratories are tempting botanists to vacation work at Woods Hole, Cold Spring Harbor and Vancouver Island, with several more stations yet to be heard from. In the interior the Lakeside Laboratory at Cedar Point (near Sandusky), and the alpine laboratory on Pike's Peak offer to the inlanders out-of-door recreation mingled with serious study. There should be little difficulty in determining where to go, in case one wants to get out into the air while at work. The sea always calls some of us, and the mountains too call us with a voice that we can not resist. Down by the sea we may study the strange and beautiful things that grow in the depths; on the mountain side we may study changes in vegetation due to altitude and low temperature. At the seaside we may bathe when we are warm and tired; on the mountain side we cool off in the thin air two miles above sea level, and rest under the fragrant Rocky Mountain pines and fir trees. Wherever we go we may do a little work—possibly a good piece of work; at any rate we may be

refreshed physically and mentally, so as to return to our class-rooms and laboratories in September able to do better work there.

CHARLES E. BESSEY.

#### THE BIOLOGICAL LABORATORY OF THE BUREAU OF FISHERIES AT WOODS HOLE, MASS.

THE laboratory will be thrown open on June 16, and will be at the service of a limited number of investigators, for the study of problems in marine biology, from that date until the middle of September. The occupant of a table will as usual be furnished with the ordinary apparatus and reagents and with material for research free of charge. Certain of the steam and other vessels of the bureau will be at the disposal of the laboratory, and systematic collecting will be in progress during the entire season. Candidates for laboratory privileges are advised to submit their applications as early as possible. Those who are not already known at the station will be expected to offer evidence of their qualifications. Applications should be sent to the director, Dr. F. B. Sumner, College of the City of New York, New York, N. Y.

#### SCIENTIFIC POSITIONS IN THE PHILIPPINE ISLANDS.

THE Civil Service Commission announces that on June 1-2, 1904, examinations will be held for the positions named below in the Bureau of Government Laboratories at Manila, P. I.

Pathologist.....	\$1,800
Pharmacologist .....	1,800
Chemist, Analytical Division, soils and waters .....	1,600
Chemist, Economic Products Division, familiar with organic chemistry, essential oils, etc .....	1,600
Chemist and collector, Economic Products Division .....	1,500
Assistant for physical chemist.....	1,500
Entomologist .....	1,400
Bacteriologist of Serum Division.....	1,400

These salaries represent the lowest salaries for entrance into the Bureau and it is the plan, as far as possible in the future, to bring in new men in the lowest salaried positions,